

ABSTRACT

A field effect transistor having a narrow channel and a method for forming such a device. An upstanding nanopillar is formed from a substrate by directional etching of the substrate preferentially masked by a nanoparticle. A stack of planar layers of material is formed adjacent and around the nanopillar. The bottom layer, adjacent the substantially planar top substrate surface, comprises insulating material. A conductive gate layer overlies the bottom layer while a second insulating layer overlies the gate layer. The pillar material is etched to leave a nanopore into which semiconductor material is deposited, forming an upstanding channel, after insulating material has been deposited on the interior of the nanopore. The source or drain may be a conductive substrate or a doped region of the substrate formed immediately beneath the nanopillar with the other electrode formed by doping the region adjacent the top of the channel.